Salt BMP List - Short

Note: this list of BMPs was assembled by reading through 12 different resources, which were mostly BMP manuals for operations. The BMPs were then categorized into 1) Equipment/Tools 2) Before Winter 3) Before the Storm 4) During the Storm 5) After the Storm 6) Deicers and then further broken into practices for winter maintenance in "General", for "transportation" and for "Parking lots, sidewalks, and properties" under each of the major categories (1-6). This document contains a shortened list of each practice, whereas the accompanying document maintains the format and includes more details on each practice.

- **Salt Institute 11 Excellent Management Practices (From 5/24/18 Training – PPT presentation & video)**
  Note, color coding for Fundamental 5 (green) versus the Second 6 (blue) is used throughout the document to highlight other ways of presenting these best practices
    - Fundamental 5:
        1. Calibration
        2. Measurement
        3. Accountability
        4. Level of Service
        5. Training
    - The second 6
        6. Variable Application Rates
        7. Forecasts
        8. Cold Temperature Usage
        9. Liquid Usage
        10. Pre-wetting
        11. Anti-icing

1. **Equipment/Tools**
    - General
        - Identify the equipment you ultimately will need and develop a long-range plan to get there.
        - Maintenance Decision Support System
        - Plows (side wing, flexible/sectional blades, other equipment to maximize plowing effectiveness)
        - Spreaders (electronic, low rate spreaders, ground-speed controls)
        - Anti-icing (stream nozzle spacing, bar height, pressure levels)
        - For Brine (salimeters/hydrometers, mixing and holding tanks, pumps, containment)
    - Transportation (precise weather information, chutes, mount spreaders low, AVL, precision deicing)
    - Parking lots, sidewalks, and properties (temperature sensors, for sidewalks - push spreader with shields or drop spreaders)
2. **Before Winter**
    - General
        - **Winter Maintenance Planning**
            - Develop a Salt Management Plan
        - Review the Winter Maintenance Plan with crew and managers, address accountability
        - Record keeping and annual reports (track salt use and other performance objectives)
    - Calibrate your equipment
    - Test material
    - Train all involved personnel
    - Transportation (document the level of service goals and plan your routes, inform citizens)

- Parking lots, sidewalks, and properties (develop and review plan/level of service, walk and inspect property)

3. **Before the Storm**
   - General
     - Weather – have detailed forecast of timing, type and scope of storm)
     - Anti-icing – plan for liquids and solids treatment prior to precipitation
     - Pretreating – treat salt or sand with a liquid to speed melting)
     - Storage
       - Liquids (know and avoid freezing points, ensure tank integrity or containment)
       - Salt piles: location and type of storage piles and site management practices
   - Parking lots, sidewalks, and properties
     - Storage
       - Salt and sand piles: impervious surface, covered/indoors, tidy and away from water/stormwater
       - Salt bags: seal/protect from precipitation and dispose properly
4. **During the Storm**
   - General
     - Weather – pavement temperature critical
     - Plow quickly, prior to deicing
     - Keep snow piles away from waterbodies/detention basins
     - Vary application rates to weather/storm conditions:
     - Utilize spread patterns that reduce waste/over application
     - Use pre-wetted or pretreated salt
     - Use abrasives only in specific circumstances, and sweep after event
     - Loading/hauling (covered or level areas, avoid/address spills, cover loaded trucks)
   - Transportation
     - Plowing/Application (train for and use multi-lane plow trains, coordinate on multi-route roads, optimize speed and deicer application)
   - Parking lots, sidewalks, and properties
     - Sidewalks (drop spreaders or side shields)
     - Stairs (hand held spreaders, reduce/close access where possible)
     - Parking lots (gage salt needs from application rate/lot size, pile snow downhill of stored salt)
5. **After the Storm**
   - General (clean equipment/contain wastewater, record keeping, evaluate operations, lessons learned)
   - Parking lots, sidewalks, and properties (clean up, do not use up supplies at season end)

6. **Material**

Chemical	Lowest Practical Melting Temp.	Eutectic Temp.	Optimal Concen-tration
NaCl (Sodium Chloride) —Delivered as rock salt, can be made into a brine. The basis of many bagged blends. Corrosive. Inexpensive. Very available. Most commonly us used without a corrosion inhibitor added, but corrosion inhibited products are available.	15º F	-6º F	23%
$MgCl_2$ (Magnesium Chloride)—Delivered primarily as a liquid, other forms available. Used for anti-icing, pre-wetting and stockpile treatments. Corrosive. Higher cost. Often has a corrosion inhibitor added. Often added to salt brine.	-10º F	-28º F	27 to 30%
$CaCl_2$ (Calcium Chloride)—Delivered as flakes, pellets, or liquid. Corrosive. Most effective ice melter at very cold temperatures. Sometimes used incorrectly to open storm drains. Higher cost. Often has a corrosion inhibitor added. Often added to salt brine.	-20º F	-60º F	30%
CMA (Calcium Magnesium Acetate)—Delivered as a powder, crystals, pellets, or liquid. Liquid CMA is used mainly on automated bridge deicing systems. Non-corrosive to steel, biodegradable. Alternative for areas where chloride use must be limited. Higher cost.	20º F	-18º F	32%
KAc (Potassium Acetate)—Delivered as a liquid. Often used on automated bridge deicing systems and airports. Use for anti-icing, deicing. Non-corrosive to steel but corrosive to galvanized, biodegradable. Alternative for areas where chloride use must be limited. Higher cost.	-15º F	-76º F	50%
Blends— Both chlorides and acetates exist in blends. Talk to the supplier and determine the lowest practical melting temperature, the optimal concentration and the basic components in the blend. Most blends are centered on rock salt since it is cheap.			
Winter Sand/Abrasives—Winter sand has salt mixed in it to keep it from freezing. Abrasives should be used for cold temperatures when deicers are not effective. Want to minimize salt % in sand.	Never melts—provides traction only		